

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY (Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference 310900	FOR FURTHER ACTION	See item 4 below
International application No. PCT/EP2006/060251	International filing date (<i>day/month/year</i>) 24 February 2006 (24.02.2006)	Priority date (<i>day/month/year</i>) 29 March 2005 (29.03.2005)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant ROBERT BOSCH GMBH		

1. This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).

2. This REPORT consists of a total of 7 sheets, including this cover sheet.

In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.

3. This report contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|---|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the report |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application |

4. The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).

<p style="text-align: center;">The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland</p> <p>Facsimile No. +41 22 338 82 70</p>	<p>Date of issuance of this report 03 October 2007 (03.10.2007)</p> <hr/> <p>Authorized officer Agnes Wittmann-Regis</p> <p>e-mail: pt06.pct@wipo.int</p>
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PATENT COOPERATION TREATY

TRANSLATION

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing (day/month/year) **See form PCT/ISA/210**

Applicant's or agent's file reference

310900

FOR FURTHER ACTION

See paragraph 2 below

International application No.

PCT/EP2006/060251

International filing date (day/month/year)

24.02.2006

Priority date (day/month/year)

29.03.2005

International Patent Classification (IPC) or both national classification and IPC

F02M59/10 F02M59/36 F02M59/38 F02M63/02

Applicant

ROBERT BOSCH GMBH

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☒ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP

Date of completion of this opinion

Authorized officer

Facsimile No.

Telephone No.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2006/060251

Box No. I

Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ the translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rule 12.3(a) and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing
 - ☐ contained in the international application as filed
 - ☐ filed together with the international application in electronic form
 - ☐ furnished subsequently to this Authority for the purposes of search
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/EP2006/060251

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	1-7, 9, 10	YES
	Claims	8	NO
Inventive step (IS)	Claims	1-7, 9, 10	YES
	Claims	8	NO
Industrial applicability (IA)	Claims	1-10	YES
	Claims		NO

2. Citations and explanations:

1 Reference is made to the following document:

D1: EP 0 802 322 A (MITSUBISHI DENKI KABUSHIKI
KAISHA) 22 October 1997

2 INDEPENDENT CLAIM 1

2.1 D1 is considered the closest prior art. It discloses (the references between parentheses relate to said document, see for example column 3, lines 24-46, figures 1 and 4):
a method for operating an internal combustion engine having a piston pump (7) as a high-pressure pump which is driven by a driveshaft (83) of the internal combustion engine, wherein fuel is delivered by the high-pressure pump (7) from a low-pressure region to a high-pressure side, and the quantity of the fuel delivered by the high-pressure pump (7) is set by means of a quantity-control valve (9), wherein the high-pressure pump (7) is operated in a two-position mode, alternately with full delivery for individual or successive piston strokes and with idle delivery for individual or successive piston strokes.
Depending on the engine speed, the load or the

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Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
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pressure in a collecting line (4), fuel is delivered during 0-4 piston strokes per driveshaft rotation.

2.2 The subject matter of independent claim 1 differs from this in that the full delivery is activated when a lower pressure limit is undershot and until an upper pressure limit is reached.
The subject matter of claim 1 is therefore novel (PCT Article 33(2)).

2.3 The problem addressed by the present invention can therefore be considered that of operating a high-pressure pump in such a way that the acoustic emissions of the high-pressure pump are reduced.

2.4 The solution proposed in claim 1 of the present application for said problem involves an inventive step for the following reasons (PCT Article 33(3)): the frequency of the delivery of the high-pressure pump is restricted to the absolutely necessary value by virtue of switching to two-position control at idle, and each active delivery being implemented with the maximum delivery quantity. Here, a fixed number of delivery strokes per camshaft rotation is not defined as is the case in D1, but rather a switch is made from idle stroke to full stroke only when a pressure in the collecting line is undershot.

3 DEPENDENT CLAIMS 2-7

Claims 2-7 are dependent on claim 1 and therefore

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Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
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likewise meet the PCT requirements for novelty and inventive step.

4 INDEPENDENT CLAIM 8

D1 is considered the closest prior art. In addition to the features listed under point 2.1, it also discloses that the quantity of the fuel delivered by the fuel pump (7) into a collecting line (4) is set by the quantity-control valve (9), and that the high-pressure pump can be operated with full delivery and with idle delivery - and can do so in all ranges of the internal combustion engine, that is to say also at idle.

4.1 The subject matter of claim 8 is therefore not novel (PCT Article 33(2)).

5 INDEPENDENT CLAIMS 9 AND 10

Independent device claims 9 and 10 relate to a control unit and to an item of software for carrying out the method as claimed in one of claims 1-7. Since said claims are novel and inventive, this also correspondingly applies to claims 9 and 10.

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/EP2006/060251

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

1. The application does not meet the requirements of PCT Article 6 because claims 1 and 2 are unclear.
 - 1.1 The phrases "lower pressure limit" and "upper pressure limit" in claim 1 are vague since the pressure limit is not clearly defined. For a clear definition, there lacks a reference as to which pressure (fuel pressure in the collecting line) said pressure limit is provided for. This leaves the reader uncertain as to the meaning of the technical feature in question.
 - 1.2 Also insufficiently defined, and therefore unclear, is the phrase "lowering the injection quantity" in claim 2 (what injection quantity?).

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